

FY 2001 Annual Report

Servicewide Inventory and Monitoring Program



National Park Service

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Introduction

To fulfill the National Park Service's mission of preserving the nation's heritage, it is essential that park managers know the nature and condition of the resources placed under their stewardship. Because of the importance of information on resources, the National Park Service commenced an Inventory and Monitoring Program in 1992. However, although periodic small increases for this program were received, there was not enough funding to complete basic inventories in a reasonable timeframe or to monitor the condition in even the selected prototype monitoring parks. Therefore, the Natural Resource Challenge made the acceleration and expansion of these efforts a keystone.

The table below shows the relationship of the Inventory and Monitoring Program as it existed in FY 2000 and in FY 2001 with the Natural Resource Challenge funding increase. The program encompasses 287 parks (270 administrative units for the purpose of the program) that have a significant amount of natural resources. Parks included in the program are listed in Appendix I. Inventory and monitoring data are needed for park management in these areas.

Inventory and Monitoring Funding:	
Available in FY 2000	\$ 12,799,000
Pay Adjustment	
Transferred permanently to	
Prototype parks	(251,400)
Natural Resource Challenge Increase	5,950,000
 FY 2001 TOTAL	 \$ 18,465,000
Inventory and Monitoring Funding Categories:	
Resource Inventory Projects	\$10,759,500
Monitoring and other projects	5,588,000
Database Development	730,000
Regional Coordinators	605,000
Program Administration	782,500
 TOTAL	 \$ 18,465,000

Resource Inventories: Discovering America's Natural Heritage

In FY 2000, the first year of the Natural Resource Challenge, the Service received a base increase of \$7,309,000 for inventories. An additional \$1,750,000 was received in FY 2001 specifically for vegetation mapping. Using that additional funding, the Service is continuing to complete inventories of the basic natural resource placed under its'

stewardship. Those basic resources are listed in the following table. Appendix II-A illustrates how the Natural Resource Challenge funding was distributed across major inventory efforts during FY 2001. A description of selected inventory projects is provided in following sections.

The inventories are being closely coordinated to ensure that they satisfy several important criteria:

- Collectively, the inventory data represent the “core” set of information park managers need to deal effectively with park planning, management, and protection,
- The inventories are being conducted in accordance with clearly defined protocols and quality-assurance standards, and
- Data obtained through the inventories will be compatible to allow for synthesis and analysis at ecosystem and other broad levels.

Inventories of natural resources are undertaken to gather the most relevant scientific information needed to make sound decisions regarding their access or protection. The National Park Service is conducting inventories using a network approach (described in the section on Park Vital Signs Monitoring) to ensure cost efficient sharing of researchers and methods. Parks must make a decision about their most vital inventory needs based on the context of resources and their larger ecosystem.

The 12 Basic Natural Resource Inventories

- Natural Resource Bibliography
- Species List
- Vegetation Map
- Base Cartography Data
- Species Occurrence and Distribution
- Soils Map
- Geology Map
- Water Chemistry Data
- Water Body Location and Classification
- Air Quality Data
- Air Quality Related Values
- Meteorological Data

Inventory Projects Receiving Emphasis in FY 2001

The increased funding for natural resource inventories received through the Natural Resource Challenge in FY 2000 and FY 2001 will allow the National Park Service to significantly increase the rate at which the basic natural resource inventories are completed. By combining that funding with funds previously available for inventories, the Service now estimates that it will complete the basic resource inventories for all 270 natural resource parks over a period of approximately 10 years, rather than the 20-25 years projected to complete the inventories prior to receiving the additional funding through the Natural Resource Challenge.

The Washington Office has worked closely with park resource managers and others to obtain information about which of the 12 basic natural resource inventories are of highest priority to the parks for addressing various resource management and protection issues, as updating resource management plans and developing management actions to respond to a particular threat to park resources. Those priorities were revised in fiscal 1997 and are currently being used to establish the service-wide strategies for completing the inventories. Appendix II-B provides a listing of the number of inventories in all categories completed through the end of FY 2001 and a projected schedule for completion of the outstanding inventories.

In FY 2001, inventory funding was devoted primarily to five of the basic inventories: biological inventories, vegetation mapping, air quality data, soils surveys, and geologic resource inventories. A brief summary of each of those efforts during FY 2001 appears below. A listing of all inventory projects undertaken by the Inventory and Monitoring Program during FY 2001, other than network biological inventories discussed below, appears in Appendix II-C.

Network Biological Resource Inventories

FY 2001 Funding Allocation: \$5,906,293

The basic goal of the biological inventory program is to provide park managers with comprehensive, scientifically based information about the nature of selected biological resources occurring within park boundaries. The information will be presented in a form that increases the accessibility and utility for making management decisions and for educating the public. The inventories will also lay the groundwork necessary for park managers to develop effective monitoring programs and to formulate effective management strategies for resource management and protection. To attain these basic goals, biological inventories have been designed to meet three basic objectives:

- To document through existing, verifiable data and targeted field investigations, the occurrence of at least 90 percent of the species of vertebrates and vascular plants currently estimated to occur in the park.

- To describe the distribution and relative abundance of species of special concern, such as Threatened and Endangered species, exotics, and other species of special management interest occurring within park boundaries.
- To provide the baseline information needed to develop a general monitoring strategy and design that can be implemented by parks once inventories have been completed, tailored to specific park threats and resource issues.

Conducting field inventories for biological resources can be very costly and time consuming. Therefore, major attention is being given to conducting the inventories in the most cost-effective manner. One way costs are being minimized is by conducting the inventories in networks of parks, rather than in individual parks. Previous efforts have shown that significant cost savings and efficiency can be realized by working simultaneously in several parks in close proximity to each other. Therefore, the 270 natural resource parks included in the biological inventory program have been organized into 32 separate park networks. These networks are essentially the same as those that will be utilized for park vital signs monitoring efforts.

Funding for Network Biological Inventories in FY 2001

In Fiscal year 2001, the National Park Service allocated \$5,906,293 for conducting network-based biological inventories Service-wide. The manner in which those funds were allocated on an individual park network basis is illustrated in Appendix II-D. The total amount of funding allocated to each network over the lifetime of the biological inventory effort (about four years for most networks) was developed through a formula which took into consideration the amount of staffing needed to conduct inventories within all parks included in the network, the geographic separation of parks within the network, and a relative cost of living for the area of the county the network occurs in. The amount of funding allocated to each network during any given year is in accordance with detailed study plans each network developed in fiscal year 2000 and submitted to the Washington Office for review and approval. At the end of Fiscal 2001, 24 networks had approved biological inventory study plans while the plans for the remaining eight networks were still being revised and/or reviewed.

Leveraging and Out-Sourcing With Network Biological Inventory Funds

During FY 2001, the 30 park networks conducting network biological resource inventories used those funds in a wide variety of ways, including supporting NPS personnel and out-sourcing. The amount of funding used for external contracts and/or Interagency Agreements and the number of networks involved were as follows: U.S. Geological Survey (\$727,302; 16 networks), Other Federal Agencies (\$0), Universities (\$1,760,785; 18 networks), and other non-Federal cooperators (\$1,296,808; 15 networks). In addition to the funding provided through the Natural Resource Challenge, the networks also received a total of \$302,452 from various partners and cooperators. A total of

\$455,284 of park base or other existing NPS funds were also expended on the network biological inventories during FY 2001.

Museum Voucher Searches

Another way that costs of the biological inventories can be minimized is by making maximum use of existing information, especially that available from examination of voucher specimens in parks and non-NPS museum and herbaria collections. The NPS has spent considerable amounts of funding in previous years conducting inventories for many species of vertebrates and vascular plants in parks. In this respect, it will be important for the NPS to be able to provide “evidence” that these particular species occur in parks or at least have been known to occur in parks at some time in the past. Information about the historical presence in parks is critical, especially if surveys that are more recent do not find the species in the park. Information on vouchers is being gathered through both centralized efforts and by the efforts of individual parks or park networks and entered into the NPS servicewide species database, NPSpecies.

During FY 2001, parks in 28 networks were actively collecting historical information on vouchers and species occurrence in parks and entering the data into the NPSpecies database. By the end of FY 2001, a total of 136,372 vouchers and 257,422 species listings had been entered into NPSpecies. These efforts suggest that the number of parks which have already met the 90 percent completion criterion for each of the major taxa included in the biological inventories are: plants 95, birds 72, mammals 39, fish 81, amphibians and reptiles 38.

Overview of Network Biological Inventory Field Projects

During FY 2001, 30 park networks received some level of funding for vertebrates and vascular plant inventories. Two networks (Mid-Atlantic and Northeast Coastal and Barrier networks) did not receive funding for these projects, since they were still formulating study plans for the biological inventories in those parks. The networks are scheduled to receive funding for field projects in FY 2002, providing they submit acceptable study plans.

The type of biological inventories conducted by each network during FY 2001 depended upon a number of considerations, including the completeness of park inventories as revealed by voucher searches, the priority of information needed to meet park management needs, and the availability of contractor or other personnel to perform the field work. Taken as a whole, the number of parks having inventories in progress for each of the major taxa during FY 2001 was: birds 198 parks, mammals 231 parks, fish 189 parks, amphibians and reptiles 232 parks, and vascular plants 175 parks. A brief summary of several of those field inventory projects is as follows. Collectively, the summaries provide a good overview of the types of efforts underway and progress made by the 30 networks conducting field projects during FY 2001.

Northwest Alaska Network – This network consists of Bering Land Bridge NPS, Cape Krusenstern NM, Gates of the Arctic NPP, Kobuk Valley NP, and Noatak Nps.

In FY 2001, the network completed a 4-year study plan for conducting biological inventories throughout the network, hired a full-time inventory coordinator, and initiated inventories of vascular plants, small mammals, and montane nesting birds in selected network parks.

Central Alaska Network – The Central Alaska network includes Denali NPP, Wrangell-St. Elias NPP, and Yukon-Charley Rivers Nps. During FY 2001, small mammal inventories were conducted in Yukon-Charley and Wrangell-St. Elias through a cooperative agreement established with the University of Alaska. In Yukon-Charley, 1,905 specimens representing 17 different species were captured. In addition, 416 specimens and 15 species were captured in Wrangell-St. Elias. Freshwater fish inventory work was also initiated in Wrangell-St. Elias.

Southeast Alaska Network - This network, which includes Glacier Bay NPP, Klondike Gold Rush NHP, and Sitka NHP, developed an interagency agreement with the USGS Alaska Science Center to perform inventories of marine/estuarine fish in all 3 parks. The network also contracted with the Alaska Natural Heritage Program to design vascular plant inventory, which will be conducted during FY 2002 and FY 2003. The network also concentrated on compiling and analyzing existing information on birds, freshwater fish and mammals at Sitka. The network also designed, created, and distributed flash cards for amphibian inventories at Klondike Gold rush, Glacier Bay, and Sitka.

Southwest Alaska Network – This network includes 5 park units containing diverse landscapes and ecosystems. The units are: Alagnak WR, Aniakchak NM, Katmai NPP, Kenai Fjords NP, and Lake Clark NPP.

In FY 2001, the network hired a biological inventory coordinator and initiated vascular plant inventories in Lake Clark NPP. The plant inventories were conducted in previously unsampled areas of the park using a targeted sampling scheme. Approximately 715 voucher specimens were collected. Unverified identifications show that 255 species of vascular plants were collected, including 20 species and 2 varieties that are new for the park. Several previously unknown populations of rare plants were also found at new locations within the park. The network also created amphibian flashcards and field forms to document opportunistic encounters with amphibians during inventory and non-inventory fieldwork by park staff and visitors.

Great Lakes Network - This network includes nine national park units in four states surrounding the Great Lakes. National park units contained in this network include: Apostle Islands NL, Grand Portage NM, Indiana Dunes NL, Isle Royale NP, Mississippi National River, Pictured Rocks NL, Saint Croix National Scenic Riverway, Sleeping Bear Dunes NL, and Voyageurs NP.

During FY 2001, biological inventory funding was used to conduct nine inventory projects in six parks. Small scale, targeted inventories were conducted for taxonomic groups known to be below the service-wide goal of 90 percent verification. These targeted inventories were conducted for bats and small mammals (Voyageurs NP), bats (Sleeping Bear Dunes), and inland fish (Grand Portage, Pictured Rocks, Sleeping Bear Dunes, and Indiana Dunes). The network also conducted large-scale field investigations, including distribution and abundance estimates for species and species assemblages that are of special concern to network park managers. Those inventories included Lynx (Voyageurs), freshwater mussels (Mississippi National Scenic Riverway), grassland birds (Sleeping Bear Dunes), and nearshore fish of Lake Superior (Apostle Islands and Isle Royale).

Heartland Network - The Heartland Network includes 15 national park units located in eight states of the central USA. The Heartland network parks are: Arkansas Post NM, Buffalo NR, Cuyahoga Valley NP, Effigy Mounds NM, George Washington Carver NM, Herbert Hoover NHS, Homestead NMA, Hopewell Culture NHP, Hot Springs NP, Lincoln Boyhood NM, Ozark NSR, Pea ridge NMP, Pipestone NM, Tallgrass Prairie NP, and Wilson's Creek NB.

Biological inventories conducted by this network during FY2001 included six amphibian and reptile inventories, four vascular plant inventories, and four exotic plant inventories in a total of 10 different network parks. Amphibian and reptile inventories were conducted in Arkansas Post, Hot Springs, George Washington Carver, Wilson's Creek, Ozark, and Hopewell Culture. Exotic plant inventories were conducted in Pea Ridge, Lincoln Boyhood, and Cuyahoga Valley while vascular plants were inventoried in Buffalo River, Hot Springs, Pea Ridge, and Lincoln Boyhood. In addition to conducting the inventories, this network has undertaken special efforts to build partnerships for their inventory and monitoring program. These efforts include giving presentations to major colleges and universities in the area, at local meetings of professional societies, and other local groups.

Northern Great Plains Network - This network includes 13 parks located in Nebraska, North and South Dakota, and eastern Wyoming. Park units included in the network are: Agate Fossil Beds NM, Badlands NP, Devils Tower NM, Fort Laramie NHS, Fort Union Trading Post NHS, Jewel Cave NM, Knife River Indian Villages NHS, Missouri National Recreation River, Mount Rushmore NMEM, Niobrara National Scenic River, Scotts Bluff NM, Theodore Roosevelt NP, and Wind Cave NP.

Biological inventory funding provided to the network during FY 2001 was used primarily to identify, assess, and record existing biological data, populate service wide databases (e.g. NPSpecies and NRBIB), coordinate with other agencies and subject matter experts, conduct field inventories for fish, initiate a museum search for voucher specimens, and identify gaps and priorities for future inventories. An assessment of fish documentation completeness was made for all parks in the network and field inventories were conducted by Montana State University personnel at Wind Cave, Scotts Bluff, Devils' Tower,

Mount Rushmore, and Fort Laramie to bring fish inventories for those parks to the 90 percent servicewide standard. An important finding of those inventories was that the Plains Topminnow, a species of concern both in South Dakota and at the global level, was not found in the intensive fish surveys at Wind Cave National Park. Similar assessments of documented inventory completeness were completed for all network parks for mammals, birds, amphibians and reptiles, and vascular plants. Field inventories for those taxa will be initiated in FY 2002.

Coastal and Barrier Network – The Northeast Coastal and Barrier network includes eight parks located in Virginia, Maryland, New York, New Jersey, and Massachusetts. Cape Cod National Seashore, one of the NPS prototype monitoring programs is located in the network along with Assateague Island NS, Colonial NHP, Fire Island NS, Gateway NRA, George Washington Birthplace NM, Sagamore Hill NHS, and Thomas Stone NHS.

During FY 2001, the network contracted with Dr. Les Mehrhoff, an expert on exotic plants and curator of the herbarium at the University of Connecticut, to evaluate existing plant data for network parks to determine if the service-wide standard of 90 percent completeness has been achieved by consulting local flora and published literature. The results of that effort will be used to determine if additional field inventories are needed in order to achieve the service-wide completeness standards. During FY 2001, biological inventory funds were added to an existing agreement with the Wildlife Conservation Society to allow for additional distribution and abundance sampling for species of reptiles and amphibians at Gateway. Reconnaissance inventory of reptiles and amphibians at Colonial was also completed while freshwater fish inventory for Cape Cod and several other parks in the northeast continued.

Northeast Temperate Network –This network includes 10 national parks and historic sites with significant natural resources covering a wide range of temperate forest, from coniferous to mixed deciduous woodlands to transitional forests, across Maine, New Hampshire, Vermont, Massachusetts, New York, Connecticut, and New Jersey. During FY 2001, this network completed inventories for amphibians and reptiles at Acadia NP, Saugus Iron Works NHS, Minute Man NHP, Roosevelt-Vanderbilt NHS, Saratoga NHP, and Saint-Gaudens NHS.

National Capital Network –This network includes 11 national park units with significant natural resources in the District of Columbia, Virginia, Maryland, and West Virginia. Included in the network are: Antietam NB, Catoctin Mountain Park, Chesapeake and Ohio Canal NHP, George Washington Memorial Parkway, Harpers Ferry NHP, Manassas NBP, Monocacy NB, National Capital Parks – East, Prince William Forest Park, Rock Creek Park, and Wolf Trap Farm Park.

In FY 2001, this network initiated several biological inventories, including inventories for deer, mammals, birds, reptiles, and amphibians. Small mammals inventories were initiated at Antietam, Catoctin Mountain Park, Chesapeake and Ohio Canal, George Washington Memorial Parkway, Harpers' Ferry, National Capital Parks – East, Rock Creek, and Wolf Trap Farm. One unique inventory being conducted in this network

involves distance sampling for white tailed deer density estimation. Deer populations pose a special management problem for many park managers and it is difficult to obtain an accurate estimate of deer densities without distance estimates between the observer and the deer. As part of this inventory, Dr. Underwood from the USGS and his team conducted a distance sampling training session for network resource managers and support staff who applied the method to estimate deer densities at each park in the network. Another significant accomplishment for this network during FY 2001 was the development of bird inventory protocols, including data sheets, instruction manuals, and maps. Bird inventories are underway at a number of the parks in the network utilizing these products and volunteer participants identified by promoting NPS bird inventories with local bird clubs through presentations, newsletters, and a web page.

Southeast Coast Network – This large network includes 17 parks with significant natural resources and extends along the Atlantic Coast from the North Carolina-Virginia border down to Cape Canaveral, Florida and inland as far as Atlanta, Georgia and the Alabama coastal plain.

In FY 2001, inventory projects for this network included the initiation of amphibian and reptile surveys at Cape Hatteras NS, Cape Lookout NS, Castillo De San Marcos NM, Chattahoochee NRA, Charles Pinckney NHS, Congaree Swamp NM, Cumberland Island NS, Fort Raleigh NHS, Fort Matanzas NM, Fort Pulaski NM, Fort Sumter NM, Horseshoe Bend NMP, Kennesaw Mountain NBP, Moores Creek NB, Ocmulgee NM and Timucuan Ecological and Historical Preserve.

Gulf Coast Network - This network includes 9 national parks with significant natural resources in those states bordering the Gulf of Mexico. In FY 2001 inventory projects by this network included initiation of amphibian and reptile inventories on Palo Alto Battlefield NHS, Padre Island NS, and a vascular plant survey on San Antonio Missions NHP.

Northern Colorado Plateau Network – This network comprises 16 arid land parks located in Utah, western Colorado, southwest Wyoming, and northern Arizona. Included in the network are: Arches NP, Black Canyon of the Gunnison NP, Bryce Canyon NP, Canyonlands NP, Capitol Reef NP, Cedar Breaks NM, Colorado NM, Curecanti NRA, Dinosaur NM, Fossil Butte NM, Golden Spike NHS, Hovenweep NM, Natural Bridges NM, Pipe Spring NM, Timpanogos NM, and Zion NP.

In FY2001, inventories of amphibians and reptiles, birds, mammals, and/or plants were conducted in 13 of the 16 network parks. The network contracted with Northern Arizona University and the Rocky Mountain Bird Observatory to conduct the bird inventories for network parks. Mammal and amphibian and reptile inventories were conducted through agreements with the USGS Biological Resource Division. The network staff was expanded and significant progress was made on organizing existing data and information using service-wide databases.

One difficulty arising when inventories are conducted simultaneously in a number of parks, as in the Northern Colorado Plateau Network, relates to the issuance of research and collection permits to field investigators. These permits are typically issued by the park superintendent and investigators are required to obtain a separate permit for each park he/she works in. In FY 2001, the Northern Colorado Plateau Network tested a process for administering research permits for inventory and monitoring projects at the network level. Through this process, a single permit was issued to each individual investigator conducting inventories across several parks in the network. Environmental compliance for inventory work was also coordinated at the network level.

Rocky Mountain Network - The Rocky Mountain Network is comprised of six dispersed parks located in Colorado and Montana. The parks in this network include: Florissant Fossil Beds NM, Glacier NP, Grant-Kohrs Ranch NHS, Great Sand Dunes NP, Little Bighorn NM, and Rocky Mountain NP.

Because of funding limitations, and priorities, most efforts by this network in FY 2001 focused on data management efforts in larger parks and completing field inventories for the smaller parks. Dr. Stephen Corn and associates of the USGS from the Northern Rocky Mountain Science Center and the Aldo Leopold Wilderness Research Institute began work on inventories of reptiles and amphibians at Grant-Kohrs Ranch and Little Bighorn. Dr. Corn also continued inventory projects at Glacier utilizing funding provided by the USGS Amphibian Research and Monitoring Initiative (ARMI). Dr. Erin Muths, also from the USGS, began inventories of reptiles and amphibians at Great Sand Dunes and Florissant Fossil Beds. During FY 2001, agreements were also established with Dr. Al Zale and Dr. Robert Bramblett from Montana State University to conduct fish inventories at Grant-Kohrs, Great Sand Dunes, Florissant Fossil Beds, and Little Bighorn. Projects were coordinated through a cooperative agreement with the Rocky Mountain CESU.

Greater Yellowstone Network – The Greater Yellowstone Network consists of three units of the national Park Service: Yellowstone NP, Grand Teton NP, and Bighorn Canyon NRA. An aggressive program of biological inventories was initiated in the spring and summer of 2001 by this network. Five individual projects across network parks were initiated. A sixth project, an inventory of alpine lakes in Grand Teton NP was delayed because of a scheduling conflict with the Wyoming Game and Fish Department which has statutory authority for fish within the park. The project will be initiated in FY 2002.

Southern Plains Network – The Southern Plains Network includes 10 parks with significant natural resources in Colorado, Kansas, New Mexico, Oklahoma, and Texas. Biological inventories were completed at two parks within the network, Bent's Old Fort NHS and Fort Larned NHS. Lyndon B. Johnson NHP, Lake Meredith NRA, and Alibates Flint Quarries NM completed a task agreement with the Texas Conservation Data Center to conduct field inventories of vertebrates and vascular plants. In working with the New Mexico Natural Heritage Program, a task agreement was written to perform biological inventories at Capulin Volcano NM, Fort Union NM, and Pecos NHP. During FY 2001,

the network also began the process of populating NPSpecies, NPBib, and the Dataset Catalog, through data mined at each park.

Sonoran Desert Network - The Sonoran Desert Network includes 11 park units in southern Arizona and western New Mexico. During FY 2001, a field crew from the USGS Biological Resources Division focused on completing inventories for Casa Grande NM, Gila cliff Dwelling NM, Saguaro NP, Tonto NM, and Tumacacori NHP. Birds, amphibians and reptiles, and vascular plants were the initial focus, with mammal inventories starting for these parks next year.

North Coast and Cascades Network – The network consists of 7 parks within the states of Washington and Oregon. Together, they preserve areas of tremendous natural diversity, historic significance and scenic beauty. Parks in the network include: Fort Vancouver NHS, Mount Rainier NP, Ebey's Landing NHR, Olympic NP, San Juan NHP, North Cascades NP, and Fort Clatsop NM.

Fish inventories represented major efforts during FY 2001 in Mount Rainier, North Cascades, and Olympic. This project was supplemented with park base funds and other funding to expand the scope of the inventory. Terrestrial breeding amphibians listed as Federal Species of Concern were surveyed in Mount Rainier utilizing funding provided by the Northwest Forest Plan and the NPS. The project was conducted in cooperation with the U.S. Forest Service PNW Research station. Twenty-five sites were surveyed for the Larch Mountain Salamander and four new sites were discovered. Previously, only one site for this species was known. Fifty-one sites were surveyed for the Van Dykes salamander and 9 new sites discovered. A detailed survey of habitat conditions was conducted by the U.S. Forest Service to develop a model for this species across the region.

San Francisco Bay Network - This network includes eight parks with significant natural resources in the coastal northern California area. Included in the network are: Eugene O'Neil NHS, Fort Point NHS, Golden Gate NS, John Muir NHS, Muir Woods, Pinnacles NM, Point Reyes NS, and the Presidio.

In FY 2001, inventories for vascular plants, rare plants, small mammals, amphibians and reptiles, bats, birds, and coastal riparian species were conducted. Field surveys for small mammals and amphibians and reptiles for Eugene O'Neil and John Muir are 75 percent completed. Project funding provided by the NPS for inventories at Golden Gate was supplemented through a cost share arrangement with the California Fish and Game Department and USGS BRD to undertake their inventory. The inventories for aquatic species at Pinnacles identified core areas of California Red-legged frog use. Six egg masses were located. Documentation of habitat use for this federally listed species was important since the occurrence of stream breeding for this species is unusual. Red-legged frogs prefer breeding in ponds. The inventory was able to document recovery of this species into previously occupied areas where frogs had not been seen for more than six years. No Foothill yellow-legged frogs and no western spadefoot toads were located

during the inventory, leading park biologists to believe that these species are either extirpated from the monument or at least in serious decline. Historic survey accounts had “easily” located these species within Pinnacles.

Sierra Nevada Network - The Sierra Nevada Network includes Devil’s Postpile NM, Sequoia and Kings Canyon NP, and Yosemite NP.

An important component of the biological inventories conducted by this network during FY 2001 focused on aquatic systems. Mountainous regions of the western United States contain thousands of small lakes, approximately 95 percent of which were historically fishless. Intensive stocking of sport fish into these lakes has resulted in introductions of exotic fishes in up to 95 percent of the lakes. These fish introductions have greatly expanded recreational fishing opportunities. However, recent ecological research into the effects of fish introductions into these naturally fishless lakes has demonstrated that introductions have often led to the extirpation of amphibians and macro-invertebrates. Biological inventories conducted by this network will provide important baseline information for the parks to deal with these types of management issues.

Roland Knapp and this staff from the Sierra Nevada Aquatic Research lab (UC Santa Barbara) surveyed 1,500 bodies of water in Yosemite NP, resulting in 2,700 for the project. This is about 90 percent of lakes and ponds in the park. Sequoia and Kings Canyon wildlife biologists received additional funding from the park’s fee demo project to complete aquatic surveys in those parks for fish, frogs, invertebrates, and habitat characteristics. Funding was also obtained to re-survey areas in 1997 for frogs and incidence of disease in amphibians and to do genetic tissue sampling. In FY 2002, the Yosemite data will be analyzed and recommendations provided for restoring of aquatic ecosystems.

Pacific Island Network - This network includes seven national park units in Hawaii plus three other units in Saipan, Guam, and American Samoa. For purposes of conducting biological inventories, the six Hawaiian parks (excluding USS Arizona Memorial) were funded as a group, with separate funding going directly to the three other Pacific parks.

During FY 2001, the Hawaii parks’ biological inventory study plan was completed and approved, work began on population of the NPSpecies database, and targeted field inventories began. During the year, inventories for vascular plants included completion of Olaa Trench surveys at Hawaii Volcanoes NP and native and Polynesian-introduced plant mapping in areas of Kaloko-Honokohau NHP which are proposed for alien weed control. In the national park of American Samoa, inventories of the seabird populations around Tutuila Island, where the park contains one of the most significant seabird colonies in the Territory, and on Ta’u Island, where a colony of ground-nesting petrels dwells, were completed

Vegetation Mapping

FY 2001 Funding Allocation: \$ 2,250, 000

Vegetation information is another high-priority inventory need for most parks and is arguably the most important piece of information needed for park resource management and protection. Vegetation assemblages integrate diverse information on air quality, soils, topography, hydrology, meteorological conditions, and animal interactions to provide park managers with a key measure on the status of the natural systems they are managing. Vegetation maps are vital for (1) the management and protection of wildlife habitat, (2) modeling vegetation flammability and fuel implications for fire management, (3) analyses for site development suitability, and (4) evaluation of resources at risk.

Vegetation Mapping Process and Products

A standard process is followed for each park mapping project using documented, peer reviewed protocols which include a national vegetation classification system, and field method, and map accuracy assessment procedures. Although much of the actual field work, including vegetation classification, mapping, and accuracy assessment are conducted by non-government contractors, the entire process is closely monitored by USGS and NPS staff. The oversight of this group provides a baseline of experience and helps assure consistency in products developed for a wide range of parks and monuments that vary considerably in size, vegetation type, and management needs. The process followed for each park can be summarized by grouping essential activities as follows: planning meetings and discussions with park staff, collection and analysis of existing data, development of a vegetation classification, development of a sampling strategy, field work, data input and analysis, photo interpretation, cartography, validation and accuracy assessment. The 28 final products prepared for each park unit mapped are provided digitally on the USGS web site. Generally, products include: classification reports, keys and descriptions, aerial photography and overlays, spatial data, and accuracy assessment data.

FY 2001 Funding for Vegetation Mapping

As noted previously, in FY 2001, the NPS received \$1,750,000 through the Natural Resource Challenge for vegetation mapping. These funds were added to the \$ 500,000 the NPS has been providing for vegetation mapping in Alaska, bringing the total FY 2001 allocation for vegetation mapping to \$ 2, 250,000. In addition to these NPS finds, the USGS-Biological Resources Division provided \$1,163,776 towards these efforts and the NPS Fire Program committed \$1,372,000.

Of the \$1,750,000 provided through the Natural Resource Challenge, \$1,510,595 (86.4 percent) was used to support park specific projects, \$137,405 (7.8 percent) was allocated to database and protocol development, and \$102,00 (5.8 percent) was used for national vegetation mapping program administration. Appendix II-E illustrates how Natural Resource Challenge funds for vegetation mapping were distributed across parks and

activities during FY 2001. Appendix II-F summarizes the amount of funding provided by cooperators on vegetation mapping projects for which NPS funding was not provided.

Overview of Vegetation Mapping Projects

Vegetation mapping funding received through the Natural Resource Challenge allowed the Service to greatly accelerate the rate at which parks are being mapped. By combining the funding provided through the Natural Resource Challenge with other funding provided by the USGS and NPS Fire Program, the Service was able to complete 22 vegetation mapping projects, continue 14 ongoing projects, and initiate 29 new park mapping projects. The 43 ongoing or new vegetation mapping starts in FY 2001 represented a four-fold increase over what the Service had been able to achieve during previous years. The level of funding and a brief description of the vegetation mapping efforts in a number of the parks is provided below.

Sequoia-Kings Canyon National Park - Funding was provided to Sequoia-Kings Canyon NP during FY 2001 to continue the vegetation sampling, ecological characterization, and photo interpretation efforts there. In addition, the USGS Biological Resources Division provided funding for these efforts. Part of this funding was used to support park based field crews and part was used to contract for other mapping services.

Air Quality Data

FY 2001 Funding Allocation: \$ 123,000

Perhaps the most pervasive factor impacting park resources from outside the park boundary is air pollution. Yet, a large majority of parks do not currently have permanent air quality monitoring stations located within their boundaries. Therefore, these parks have to rely upon obtaining air quality information from stations located adjacent to but outside of the park's boundaries. In FY 2001, the National Park Service completed baseline air quality inventories for 250 park units through a cooperative effort between the Service and the University of Denver. The project summarized information for than a dozen critical air quality parameters using information gathered from hundreds of air quality monitoring stations throughout the United States.

Products and Status of the Air Quality Inventory

The quality of the air resources effect the visitor experience as a health issue, through limits to visibility, and as effects on plant and water resources through deposition of acidic species, nutrients, and damaging pollutants. Although NPS has measurements in about 60 park units of air quality, this is only a fraction of the 270 natural resource units included in the National Park System. The cost to do direct measurements in the remaining units would be prohibitive and take multiple years. Therefore, this inventory project used existing data to create interpolation maps of each air quality parameter and then to derive the estimated air quality for each of the I&M parks. The uncertainty in the estimates was then assessed by variance in the interpolation and by a technique of

repeated interpolation with random sites removed so that a statistical uncertainty number can be obtained. Detailed studies within Great Smoky Mountains NP are being used to improve on the methods and assess the accuracy of the interpolations. Major products from the project include:

- A table of air quality parameter estimates for all natural resource parks plus an uncertainty estimate,
- GIS climatological interpolation maps for each parameter (Air Atlas),
- Decision support GIS maps and tables to help decide what areas are at risk from air pollution or under represented in the interpolations.

Detailed study maps have been completed and the basic parameter maps completed. An estimation table of air quality parameters has been created for each natural resource park unit. A prototype Air Atlas has been produced and is being tuned for public distribution on the web. All of the air quality maps will be available from Air Atlas web site and the set of parameter estimates can be viewed for each park. The GIS themes and metadata files are being put into a form consistent with I&M format requirements.

Linkage to Ongoing Monitoring Efforts

Some of the decision support maps and tables created during the inventory effort have been created and used in new monitoring planning. Through the inventory effort, the closest monitoring station to each park has been identified. These nearby monitors may be the best source of pollutant estimates for the parks in many cases. Some nearby monitoring may also be useful in the annual trends estimates determinations. Now that the basic inventory has been completed, the NPS Air Resources Division will use co-factors such as elevation, temperature, solar radiation, forest cover, land use, pollutant emissions, etc. to improve on the parameter interpolations. The work from Great Smoky Mountains NP indicates that a greater level of detail is possible using this approach. Thus, in larger parks we may get estimates of spatial variability.

Soil Surveys

FY 2001 Funding Allocation: \$ 986,100

Detailed information about the physical and chemical properties of soils found in parks is essential for park natural and cultural resource management and protection. Soil surveys provide basic information needed to manage soil sustainability and to protect water quality, wetlands, vegetation communities, and wildlife habitats. Soil surveys also provide managers with the ability to predict the behavior of a soil under alternative uses, its potential erosion hazard, its potential for ground water contamination, its sustainability for control of exotic species and establishment of native communities, and its potential for preservation of cultural sites and landscapes.

Soil Survey Process and Cooperators

The NPS works cooperatively with the U.S. Department of Agriculture's Natural Resource Conservation Service to provide park managers with basic information about soils throughout the parks as well as more detailed information for potentially high-use or developed areas in the park (e.g. visitor centers, campgrounds, access roads, etc.). These inventories provide an orderly, on-the-ground, scientific inventory of soil resources present in these NPS units, and consist of digital maps of the locations and extent of soils, data about physical, chemical, and biological properties of those soils, and information pertaining to the use and management of these soils. The information is in sufficient detail for application by park managers, planners, engineers, and scientists to specific areas of concern. Although all of these inventories follow standard procedures, it is important to note that the actual work plans are developed or "customized" by local park personnel to meet their soil resource management needs, as part of local soils scoping sessions.

In addition to working cooperatively with the Natural Resource Conservation Service, the NPS is also pursuing the possibility of working with the private sector, including the American Association of Soil Scientists and others concerns, to get NPS parklands mapped. The availability of trained soil scientists is limited through the NRCS in some areas and the NPS sees cooperative efforts with the private sector as an important way of obtaining the technical expertise it needs to complete projects at the national level.

FY 2001 Budget and Soil Survey Projects

During FY 2001, the NPS allocated approximately \$ 300,000 of Natural Resource Challenge funding to soil survey projects. These funds were combined with existing funding the Service had available for soil survey projects, bringing the total amount of funding allocated to soil surveys during FY 2001 to \$ 986,100. An overview of three representative soil survey projects follows.

Channel Islands National Park (\$ 126,500) – At Channel Islands National Park, the soil resources inventory workplan has been developed to address issues concerning restoration of soil disturbances which may have occurred either through past or present erosional activity, livestock overgrazing, previous agricultural practices, fire, road building, or modification by invasive plants and animals. Also of interest is the correlation of soil types to various threatened, endangered, and endemic plant species, potential burrowing animal habitats, and cultural resource sites such as shell middens. One of the products of this inventory will be the development of separate soil reports and digital soil datasets for each of the five islands, to capture the concepts of "endemic" and "unique" soil types that might occur only on one island. The scheduled completion date for this inventory is FY2004.

Redwoods National Park (\$ 112,800) - At Redwood National Park, the soil resources inventory is designed to gather soil data and prepare maps of soils and potential vegetation with interpretations necessary to plan and manage land for recreation, forest health, prairie restoration, and watershed planning. Work is also being coordinated with current soil mapping activities outside the park to create a soils database for the National Park Service and California Department of Parks and Recreation to effectively manage the soil resources of Redwood National and State Parks. Issues regarding soil erosion rates and slope stability potentials by watersheds will be pursued, as well as the identification of any tsunami deposits that may be present within soil profiles in lower watershed reaches. Other products which will be provided is detailed soil chemical and physical characterization of representative soil profiles within the Tall Trees Redwood Grove, to provide insight as to the remarkable growth rates of these trees. Interpretive products such as soil monoliths, which will help visitors visualize the highly productive soils in the park, will also be provided as part of this inventory. The scheduled completion date for this inventory is FY2005.

Padre Island National Seashore (\$ 100,000) - At Padre Island National Seashore, the soil resources inventory is addressing issues regarding variable soil types that occur within different soil drainage classes, in both fresh and brackish groundwater regimes. Also of interest is the corresponding soil-vegetation relationships, which may exist in these conditions. One of the unique features of this particular soil resources inventory is the potential correlation of the various dune and beach deposits (shell, coral, mixed mineral) to soil types. This may provide additional information pertaining to sea turtle nesting sites, as well as to issues regarding suitability for vehicular traffic by soil type. Other special studies, which will be performed as part of this inventory, will be the identification of areas in which the soil resources may have been impaired by past or present oil and gas exploration activities. Soil temperature and soil moisture will be monitored as well as salinity and sodicity levels, to better understand present soil-vegetation relationships. Another product identified to be developed is a “landform/geological/vegetative/soil classification and characteristics genetic key”, which will not only be useful to the soil scientists performing the mapping in the field, but will be modified to provide a potential visual aid and interpretive product/exhibit for park visitors. The scheduled completion date for this inventory is FY 2004.

Geologic Resource Inventories

FY 2001 Funding Allocation: \$ 407,000

Geology is a dynamic, broad ranging study and a critical component of natural resource management in the National Park Service. The inventory of significant, often sensitive, geologic features and the eventual monitoring of ongoing processes are essential for an understanding of interrelations in ecological communities. To deal effectively with resource management issues, park managers require inventories of geomorphic processes and surficial geology, disturbed lands, unique geologic features, fossils, and bedrock geology, depending on which are applicable and appropriate for each park.

Geology Inventory Process and Budget for FY 2001

The geologic inventory process for a given park begins with an on-site scoping workshop involving an interdisciplinary team of technical specialists and the park resource management staff. Individuals from the USGS, Bureau of Land Management, Natural Resource Conservation Service, U.S. Forest Service, State Geologic Surveys, academic institutions, and the private sector have participated in these on-site scoping sessions. In addition to learning about the park's resource management needs and priorities involving geologic resource information, the scoping sessions also serve the function of educating park staff on geology science, geologic processes, and geologic resources in general.

The Geologic Resource Inventory provides parks with information on their geologic resources using four major products:

- A bibliography of geologic literature and maps,
- An evaluation of park geologic resources and issues,
- A digital geologic map
- A geologic report

The digital map is obtained through a variety of sources, including existing digital coverage, digitizing existing paper maps, or leveraging NPS funds with other agencies to produce new maps. All map and bibliographic information is provided in a format compatible with the park's other inventoried data sets. The evaluation is obtained through on-site scoping meetings involving NPS staff and authorities on a park's geology from the USGS, state geological surveys, or academic institutions. Reports are taken from existing literature whenever possible or, if not available, through a contracted geologic report writer.

During FY 2001, the NPS used approximately \$ 160,000 of the Natural Resource Challenge funding to supplement the geologic resource inventory service-wide. Those funds were combined with funding previously available to the NPS for geologic inventories, bringing the total NPS funding to \$ 407,000. In addition, the funding for geologic inventories were leveraged considerably through the efforts of partners, principally the USGS and state geologic agencies. Appendix II-G provides detailed information about the funding provided by NPS for several geologic inventory projects underway during FY 2001 and the amount of leverage funding provided by partners on those projects. In some cases, the amount of funding shown for the partnering agency is for an area larger than, but inclusive of, the NPS landholdings.

Status of Geologic Inventories in FY 2001

Through the end of November 2001, 57 parks in 17 states have had scoping meetings to evaluate geologic resources and issues. Summaries are posted on the NPS website.

Of the 57 scoped parks, 16 have completed digital maps that are posted and downloadable on the NPS website. Most of remaining 41 parks have maps at some stage

of completion, either in the digitizing process or underway in the field with cooperating government agencies or academic institutions.

Bibliographies have been completed for 228 of the 272 natural area parks and are posted on the NPS website. The remaining 44 parks have bibliographic data compiled but not yet validated (reviewed for unnecessary or duplicate citations).

Reports are complete for the 11 Utah parks, two in Colorado, and one in Alaska. A publication on the geology of the 13 New Mexico parks is underway in partnership with the New Mexico Bureau of Mines and Geology.

Park Use of Geologic Inventory Products

Parks are using the types of geologic products provided by the inventory in three basic ways. First, parks are using the information to add to their understanding of the park's geology for scientific, educational, or interpretive purposes. Next, parks are using the information in traditional geologic applications, such as dealing with landslides, rockfalls, or human health and safety issues. Finally, parks are integrating geologic map data with other, non-geologic, information to assist in management decisions. Some examples of how parks are using this type of inventory information in these various ways are briefly summarized below.

Scientific, Educational, or Interpretive Uses

Death Valley National Park - The park is one of the most complex and fascinating in the world. While studied for years, no comprehensive, dedicated map exists. Funded entirely by NPS inventory funds, the USGS compiled existing or new maps into a single geologic map of the park. The map will be available in the Visitor Center and will be used in the park's interpretive programs. Additionally, the park has for some time requested map coverage that would enable them to better manage ongoing mineral development.

National Capital Parks - Interpretive Staff at Harpers Ferry NHP and Chesapeake and Ohio Canal NHP are using USGS maps, produced using leveraged NPS inventory funds, as part of their visitor program.

Wrangell-St. Elias National Park and Preserve - The park used NPS inventory funds to have the USGS complete and publish the definitive report on the park's geology that both the interpretive and resource management staff use.

Cedar Breaks National Monument - The rocks that make up most of Cedar Breaks NM have never been adequately studied or mapped. In partnership with the USGS and Southern Utah University, the map and report produced through the NPS geologic resource inventory will provide much needed information for the park interpretive staff.

Utah Parks – Ten park units in Utah were included in a Utah Geologic Association geologic guidebook that is used by both park interpreters and resource managers. The NPS inventory provided funds for the publication of the guidebook.

Colorado National Monument - Using the geologic map completed with NPS inventory funds, the USGS and park have produced a poster showing how the park's geology is related to other physical, biological, and social elements. This map has garnered a number of awards.

Voyageurs National Park - This park has sought a geologic map for years and, using NPS inventory support, has partnered with the University of Minnesota and the Minnesota Survey to complete one. While initially headed for interpretive use, the resource management staff is eager to incorporate it in their park GIS coverage.

Park Resource Management Uses

Craters of the Moon National Monument – This park has used the geologic map to evaluate impacts to volcanic features. They are requesting additional NPS inventory funds for age dating to complete a map of the expanded park and preserve area.

City of Rocks National Reserve - USGS geologists, funded by the NPS, have used the geologic map and its derivatives to identify areas in the park susceptible to erosion, rockfall, favorable for climbers, and ground heave.

Glen Canyon National Recreation Area – This park awaits the completion of the first geologic map ever done of the park, leveraged with NPS inventory funds, to delineate areas in the park most susceptible to rockfall and other hazards.

Zion National Park – Zion NP awaits the completion of a revised map to delineate slope stability and rockfall prone areas within the park boundary.

Curecanti National Recreation Area - As part of an expansion proposal, the park used the geologic map provided by the NPS inventory to delineate the distribution of potential fossil rich formations in order to include them in the expanded park boundaries.

Capitol Reef National Park – Capitol Reef NP is using the map recently funded by the NPS inventory to delineate slope stability problems along the highway in the park.

Dinosaur National Monument – This park is using the geologic map to locate formations likely to be fossiliferous for both scientific and protection purposes. The park also uses the map to determine slope stability and heaving bedrock areas with the intent of predicting adverse infrastructure impacts.

Colorado National Monument – Colorado NM is using map features to compile a fire history of the region by looking at basin fill sediments.

Cape Hatteras and Cape Lookout National Seashores – These seashore parks are involved with a huge shoreline-mapping project with several Federal and North Carolina state partners looking at shoreline erosion and sedimentation. Inventory funds will be used as part of the NPS contribution to obtain the shoreline maps.

Death Valley National Park – Death Valley NP is using USGS maps and scientists as part of facilities planning to avoid construction atop active faults.

Great Sand Dunes National Monument and Preserve – This park has integrated the park map with ongoing USGS studies outside the park to study sand sources and potential adverse impacts on the dunes.

Integration of Geologic Data With Other Information

National Capital Parks - In an effort to delineate historical districts in the Washington D.C. area, the Region is using geologic maps showing historical shorelines and introduced fill.

Antietam National Battlefield - This park is awaiting USGS maps funded by the NPS inventory to determine the bedrock control on the battle's evolution. Petersburg National Battlefield has expressed an interest in doing a similar project there.

Dinosaur National Monument – Dinosaur NM is using the geologic map as a guide, park consultants have mapped spawning grounds for the threatened pike minnow, a fish that needs a particular river bottom morphology controlled by the geologic structure to reproduce. The park also uses the map to locate the rare spiranthes orchid, known to grow in the park on only one rock type.

Capitol Reef National Park – This park is using its geologic map to delineate areas favorable to finding Winkler's cactus, a threatened plant known to exist only on soils derived from a particular formation in the park.

Great Smoky Mountains National Park – Great Smoky Mountains NP is using its geologic map to delineate Cerulean Warbler habitat that has been demonstrated to be controlled by acidic soils derived from underlying shales.

Delaware Water Gap National Recreation Area - The park is aware of a threatened cactus outside the park, which is constrained to a particular formation. They are awaiting Inventory funding to complete the map inside the park.

Grand Canyon National Park – The park is using USGS maps digitized with NPS inventory funds to delineate Mexican Spotted Owl habitat by integrating the geologic, topographic, and vegetation GIS data themes.

Natural Resource Inventory Highlights for FY 2001

Basic resource inventories being conducted as part of the Natural Resource Challenge are revealing many new and exciting insights into the natural resources contained in parks. Not only are the investigations increasing our knowledge and understanding about park resources, but the information being provided is also being used in a variety of resource management functions. Some highlights from FY 2001 are briefly described below.

Biological Inventories

Helping with Exotic Plant Control

Scientists with Montana State University as well as staff from the Greater Yellowstone network have developed a GIS-based, scientifically credible and statistically sound sampling protocol for exotic and invasive plants in large tracts of non-forested areas of Yellowstone and Grand Teton National Parks (areas in excess of 120,000 acres). The model uses known distribution of weeds, vegetation habitat type, soils information, and cost per unit effort to develop a map based sampling plan for back country areas that meets logistical and funding constraints and yet provides statistical reliability at pre-established levels of acceptability. The model underwent a pilot test this summer wherein 65 transects 2 km long were sampled across four areas in the Northern Range of Yellowstone. A similar but smaller pilot endeavor was completed on the non-forested valley floor of Grand Teton NP. The results of these pilot studies are being evaluated at the present time and will be used to develop a sampling protocol to be applied both in Yellowstone and Grand Teton National Parks. The model was developed and pilot study accomplished using network inventory funds, matching funds from the Montana Center for Invasive Plant Management Seed-Money Grant Program, and in-kind donations of time from MSU faculty in weed ecology, plant ecology, modeling, and statistics.

Surveys were begun at North Cascades NP and Mount Rainier NP to document abundance and distribution of non-native plants in developed zones, trail corridors, road corridors, and riparian areas - all sensitive areas prone to exotic plant invasions. Data collected includes habitat information (physical and biological), species lists, and percent cover of non-native species.

A population of the invasive exotic plant *Polygonum japonicum* was found at CARL and reported to the park staff so that control measures can be initiated before the species spreads. Several other exotic species were detected during plant surveys at Carl Sandburg Home NHS, Cowpens NB and Kings Mountain NMP.

Devils Postpile NM plant survey in 2001 documented several exotic plant species, including the invasive bull thistle *Cirsium vulgare*, for which control measures have already been initiated.

Helping Recover Species

A survey for the federally-listed California Red-legged Frog at Pinnacles NM documented the recovery of this species into areas where the species hasn't been seen for more than 6 years. Seven core areas were identified for the species in the monument, and six egg masses were located. The lack of detections of Foothill Yellow-legged Frogs and Western Spadefoot Toads during the survey is of concern since these species historically have been easily located within the monument.

With NASA and USGS, Assateague Island NS is monitoring fine-scale changes in topography to manage rare and endangered species (e.g., Piping Plover and Sea Beach Amaranth).

A bat survey at Devils Postpile NM in California 5 federal or state-listed species of concern not previously recorded for the park.

Helping Understand and Effectively Carry Out Parks' Role in Preserving Heritage of Diverse Biota

Vascular plant species new to science discovered at Thomas Stone NHS in Maryland. This 325-acre park previously had no systematic biological inventory work. As part of plant inventory work associated with vegetation mapping, a park scientist discovered a species of sedge that is new to science. Vascular plant species new to science are rare in the eastern US, which has had a long history of botanical exploration.

Comprehensive inventories of vascular plants and vertebrates at Saguaro NP found 29 new species of plants, two new species of birds, and one new species of mammal. The surveys documented 4 species of reptiles that have not been seen at Saguaro for many years. These results highlight the importance of a comprehensive inventory program even for parks that already have species lists. The Sonoran Desert network, of which Saguaro NP is part, will use the work begun in FY 2001 in Saguaro and other desert parks to monitor biodiversity as well as changes in abundance of vertebrates and vascular plants.

Devils Postpile NM inventories in 2001 documented 50 new plant species not previously recorded in the park and 10 previously unrecorded bat species.

The distribution and abundance of a newly described species of vascular plant (*Stephanomeria fluminea*, 1999) known only from northwest Wyoming was surveyed in Grand Teton National Park. Extensive surveys within its preferred habitat, impermanent cobble beaches in the flat gravelly beds of creeks that flood and churn after snow melt, revealed a much broader occurrence than was expected.

A small mammal survey at Fort Clatsop NM in Oregon documented a species of vole that has not been found in the park for 60 years, and added the Long-eared Bat to the list of small mammals documented for the park.

Helping with Other Park Management Issues

Scientists discovered an incipient oak savanna with remnant vegetation on the battlefield at Cowpens NB and a stand of tulip poplar and oaks that may have trees more than 150 years old at Carl Sandburg Home NHS. These discoveries can be used to improve cultural landscape planning.

In a cooperative effort with NASA and USGS at Assateague Island NS, monitoring data using LIDAR technology to monitor changes in fine-scale changes in topography is being used improve restoration plans. The US Army Corps of Engineers used a map generated by LIDAR data in conjunction with the park's GIS maps to make adjustments to a proposed restoration project to better fit the desired outcome of the project.

In FY 2001, I&M vegetation monitoring results at Big Meadows in Shenandoah NP are used to mitigate effects of archeological work on rare plant communities, determine success of a large prescribed burn to control shrubs, and to educate visitors and staff.

Helping Evaluate Effectiveness of Management Actions

The freshwater mussel inventory at Mississippi NRRRA suggests that water quality regulations have helped improve habitat for mussels. Because freshwater mussels can act as the “canary in the coal mine” for aquatic environments, this could have good implications for human health as well. It is also significant that very few zebra mussels were found during the survey and that there were no noticeable impacts to native mussels. Improved water quality and the near absence of zebra mussels may mean MISS is one of the last big river mussel refuges in the Midwest. The Minnesota Department of Natural Resources and MISS have already relocated several state listed and one Federally listed species to sites within the MISS corridor and the inventory data will help locate other sites for reintroductions.

A fish survey at Pinnacles NM verified that streams remain free from exotic fish. Distribution maps of several fish species were developed within PINN streams.

Engaging Others with Parks and Providing Unique Recreational and Educational Experiences

More than 20 skilled volunteer birders have been conducting bird surveys each month since January 2001 in the National Capital network to assist the NPS with bird inventories in six parks (Antietam NB, Catoctin Mountain Park, Harpers Ferry NHP, Manassas NB, and Wolf Trap Farm Park). Collectively, the volunteers have logged more

than 680 hours and identified over 150 species including many that have never been recorded in the parks previously.

Leveraging Funding

The Greater Yellowstone Network leveraged ongoing surveys of amphibian distribution and abundance funded by the DOI's Amphibian Research Monitoring Initiative (ARMI). The number of sites surveyed in Yellowstone and Grand Teton was doubled because of network funding, and the scope of the surveys were expanded to include amphibian and reptile surveys in Bighorn Canyon.

Park Vital Signs Monitoring: A Commitment to Resource Protection

The price for protecting the natural resources in our national parks is constant vigilance. To sustain the health of park ecosystems and to diagnose and mitigate threats to their health, park managers need to identify and constantly monitor changes in vital signs of parks, just as physicians monitor the vital signs of their patients.

As part of the Natural Resource Challenge, the National Park Service is implementing natural resource monitoring that will fulfill several functions. It will enable managers to make better-informed decisions for activities where they exercise management authority and to work more effectively with other agencies and individuals where their decisions affect parks and where the data provide information about the larger landscape. It will provide early warning of abnormal conditions in time to develop effective mitigation measures. The data will help the National Park Service meet legal and Congressional mandates. Finally, this monitoring will provide a means of measuring progress towards performance goals. Monitoring park vital signs provides the Service with a means of accounting for how it is preserving part of our natural heritage, by evaluating efficacy of restoration and other management actions and by warning of impending threats to parks.

FY 2001 Funding for Park Vital Signs Monitoring

In FY 2001, the Service used funding obtained through the Natural Resource Challenge to provide operational monitoring funding to five park networks, planning funding to an additional seven networks, and funding to four prototype monitoring programs (discussed in a later section) that had not previously received funding. The amounts of Natural Resource Challenge funding provided to each of these activities is as follows.

Monitoring Efforts	FY 2001 Funding
First 5 Park Vital Signs Monitoring Networks	\$ 2,192,600
Planning funding for next 7 networks	\$ 1,050,000
Completion of prototype monitoring programs	\$ 2,345,400

Integrated Monitoring Approach

The framework for implementing monitoring in approximately 270 parks that contain significant natural resources involves two components: a network of 11 experimental or “prototype” long-term ecological monitoring (LTEM) programs begun in 1992, and 32 vital sign monitoring networks of parks linked by geography and shared natural resource characteristics.

Vital Signs Monitoring Networks and Prototype LTEM Programs



The network organization will facilitate collaboration, information sharing, and economies of scale in natural resource monitoring. The level of funding available through the Natural Resource Challenge will not allow comprehensive monitoring in all parks, but will provide a minimum infrastructure for initiating natural resource monitoring in all parks that can be built upon in the future. The prototype programs, on the other hand, are and will be engaged in more intensive monitoring than the newly funded networks and will be able to provide leadership and expertise based on their experience.

When designing the new network approach and developing guidance for the program, the Service first reviewed monitoring efforts conducted by other agencies and drew upon experiences from the prototype monitoring parks. The network approach a front-end investment in planning and design to ensure that monitoring will meet the most critical information needs of each park and produce scientifically credible data that is accessible to managers and researchers in a timely manner. The investment in planning and design also ensures that monitoring will build upon existing information and understanding of park ecosystems and make maximum use of leveraging and partnerships with other agencies and academia. The planning and design approach developed by the NPS has attracted attention from other federal and state agencies and has been adopted by SPREP,

the South Pacific Regional Environmental Programme which includes 26 member nations, for their coral reef monitoring program.

A critical, major component of both monitoring approaches is the development of modern database and geographical information system (GIS) products to make data more easily stored, accessed and available for management, research and education, both within the National Park Service and to the public.

The integrated monitoring program being designed by the networks will monitor both physical and biological resources such as air quality, water quality, geologic resources, weather, fire effects, threatened and endangered species, exotic species, and other flora and fauna. Prior to initiating field sampling, parks are required to develop specific monitoring objectives, develop sampling protocols, design databases and determine how data will be managed and analyzed, and describe the content and audience for reports and other products of the effort.

FY 2001 Park Vital Sign Monitoring Networks

In FY 2001, 5 networks that include 55 parks began to receive funding to plan and design their monitoring program. All five networks organized their Board of Directors and technical committees and developed network charters that describe how the parks will work together and how decisions will be made. Network coordinators have been hired for all networks. The activities of these first five networks in FY 2001 focused on the necessary front-end investment of planning and designing a monitoring program, which includes clearly defining the high-priority issues and data needs for the parks; developing specific, measurable objectives for the monitoring; compiling and summarizing existing information and developing conceptual models that are relevant to the proposed monitoring; evaluating existing monitoring being done by the parks and by neighboring agencies; developing a scientifically-credible spatial sampling design; developing sampling protocols; developing a data management system and database to ensure that data are available for analysis and reporting; and determining the types of information needed by managers, educators and various constituents and the type and content of reports to be produced by the monitoring program.

Many of the first 55 park funded for monitoring are already conducting some level of monitoring using park base or other funding sources, especially through partnerships with other agencies and universities (Table 1). These existing resources and partnerships will be included as part of the integrated monitoring program being designed by the park networks to promote leveraging and cost effectiveness.

Table 1. Number of parks from the first five networks (n = 55 parks) that were in various phases of designing and conducting long-term monitoring of natural resources in FY 2001 using funding from the Natural Resource Challenge or other sources (e.g., base funds or partnerships).

	Air Quality	Water Quality	Water Quantity	Geologic Resources	Plants	Animals	Landscape Characteristics
Planning and Design							
# parks potentially monitoring w/ NRC funding	55	55	55	55	55	55	55
# parks monitoring w/ other funding	7	22	5	13	22	16	6
Protocols Implemented							
# parks monitoring w/ NRC funding	3	3	0	3	5	4	4
# parks monitoring w/ other funding	10	13	4	7	12	16	2
Analysis/Synthesis Available							
# parks monitoring w/ NRC funding	3	3	0	1	4	6	3
# parks monitoring w/ other funding	6	11	3	2	5	12	0

North Coast and Cascades Network: \$195,100 (does not include funding for prototype parks)

This network of 7 parks in the Pacific Northwest includes two of the prototype LTEM programs, Olympic NP and North Cascades NPS Complex, as well as Mount Rainier NP, Ebey's Landing NHR, San Juan Island NHP, Fort Clatsop NM, and Fort Vancouver NHS. All 7 parks have completed initial scoping workshops and have held meetings with the adjacent national forests and other agencies to discuss potential collaborative efforts. Several scientists from the U.S. Geological Survey are working closely with the network parks to plan and design the monitoring program. The network coordinator is an employee of the Environmental Protection Agency on loan to the NPS. Most of the work in FY 2001 involved identifying high-priority issues and data needs for the 7 parks; reviewing protocols and objectives of existing monitoring efforts within the parks as well as those used by the Forest Service, EPA and other agencies in the region; and beginning the process of identifying, cataloging, and evaluating existing data sets. Some of the monitoring funding was used to accelerate high-priority inventories of vascular plants and vertebrates to provide data needed for the design of the monitoring program. Interagency agreements and cooperative agreements to assist the network with monitoring design were established with and work initiated by the USGS, U.S. Forest Service, EPA, Army Corps of Engineers, University of Washington, Western Washington University, Portland State University, and the Institute for Bird Populations.

Northeast Coastal and Barrier Island network: \$616,500

This network of 8 parks includes Cape Cod NS, Assateague Island NS, Colonial NHP, Fire Island NS, Gateway NRA, George Washington Birthplace NM, Sagamore Hill NHS, and Thomas Stone NHS. The network is expanding upon the monitoring design and protocol development work initiated at Cape Cod NS, and includes active participation from scientists with the USGS, EPA, and a number of universities in the northeast region. A network coordinator and data manager were hired in FY 2001, and the network held an initial scoping workshop in which they identified high-priority issues and data needs. Subsequent to the scoping workshop, nine interagency workgroups were formed on topics including shoreline change, water quality, estuarine nutrient enrichment, and data management to evaluate existing information, develop specific monitoring questions and objectives, and to summarize existing sampling protocols and potential partnerships. Monitoring funds were also used to initiate vegetation mapping and accelerate biological inventory projects that are needed for developing a spatial sampling design for monitoring resources in the parks. Cooperative agreements were established and funding was provided to the University of Rhode Island, Rutgers University, North Carolina State University, and the U.S. Geological Survey to assist with the identification and evaluation of existing information and data needs for the network parks.

Heartland Network: \$534,400

This network of 15 parks in the Midwest Region includes a number of small prairie parks (including 4 parks from the Prairie Cluster prototype LTEM program), several parks in the Ozarks such as Buffalo National River and Ozark NSR, as well as Cuyahoga Valley NP and Hopewell Culture NHP in Ohio. Sampling protocols developed by the Prairie Cluster prototype LTEM program will be extended to additional prairie parks. The network hired a coordinator and advertised for a data manager in FY2001, and began the process of determining park priorities and data needs. Park staff began the process of compiling and summarizing existing natural resource information. In April 2001, the network held a vital signs scoping workshop focusing on aquatic systems. Twenty potential vital signs were identified for further review, development, and consideration. Additional background work was conducted to prepare for the terrestrial vital signs workshop planned for November 2001. Funds were used to purchase and process aerial and satellite imagery for developing vegetation maps to be used in stratifying parks as part of a spatial sampling design and for monitoring land use and vegetation changes in and adjacent to parks. Funding was also used to accelerate biological inventories to facilitate the design of the monitoring program. The network developed cooperative agreements with the University of Missouri to review aquatic research relevant to parks in the Ozark region of Missouri and Arkansas, and with the University of Kansas to summarize aquatic monitoring protocols being used by State governments for the states that include Heartland network parks, and by other federal agencies.

Sonoran Desert Network: \$520,000

The Sonoran Desert network consists of 11 small parks in southern Arizona, including Organ Pipe Cactus NM and Saguaro NP. The network has developed a strong partnership with USGS and university scientists through the Cooperative Ecosystems Studies Unit, and has held planning meetings with adjacent protected areas in Mexico. A network coordinator and data manager were hired in FY 2001, and the Board of Directors and technical advisory committee were organized. Parks in the network began listing and prioritizing their issues and data needs, and the network coordinator began compiling information on existing monitoring being conducted in and near network parks. The network has a particularly strong partnership with the USGS-BRD field station and Cooperative Ecosystems Studies Unit established at the University of Arizona; in FY 2001, more than 25 graduate students from the university were involved in inventory and monitoring work for the network. Work began on conceptual modeling related to exotic plant monitoring, which was initially identified as the leading issue for network parks.

Cumberland/Piedmont Network: \$326,600 (does not include funding for prototype park)

This network includes Mammoth Caves NP and 13 small parks in the Appalachian Mountains. The network is working closely with the Appalachian Highlands network and staff from the Great Smoky Mountains NP prototype LTEM program to plan and design a monitoring program for all of the Appalachian Mountains parks. A network coordinator was hired in August 2001 and began the process of identifying high-priority issues and data needs for the parks and compiling and summarizing existing natural resource information. The data manager position was advertised, but no qualified applicant could be found and the position is being readvertised. Through a cost-sharing agreement with the U.S. Forest Service, funding was provided to obtain aerial photography, and cooperative agreements were established with the University of Georgia and Association for Biodiversity Information to begin developing vegetation maps that will assist with the monitoring design.

FY 2001 Planning

To facilitate network readiness for funding and make efficient use of resources, \$150,000 was withheld from each of the first five networks (in FY 2001 only) to forward fund the networks planned for funding for FY 2002. This funding strategy allowed the FY 2002 networks to hire a network coordinator and data manager to begin compiling existing information and understanding in preparation for meetings and workshops as part of the design process. Thus, in FY 2001, more than 100 parks benefited from funding to begin the design process for park vital signs monitoring. When the next round of networks is funded, the FY 2001 networks will receive full funding. A similar procedure would be anticipated for future years. This procedure will facilitate preparing for future monitoring and funding. This strategy is based on experience with prototype parks, which indicated that it is difficult to absorb large amounts of new funding in one year. It will allow the

next seven networks to make more progress in their first year than the first five networks were able to do, since the first five networks funded spent much of their first year hiring coordinators.

As a result of this approach in FY 2001, 7 networks, including 46 parks, received planning funds. The remaining networks will be funded through a phased approach. The seven networks are:

Central Alaska

A network of 3 parks located in interior Alaska. Reference park: Denali National Park and Preserve).

National Capital

Eleven parks located in the Washington, D.C. area. Reference park: Prince William Forest Park.

Northern Colorado Plateau

A network of 16 parks located in the Intermountain West. Reference park: Canyonlands National Park.

Mediterranean Coast

A 3-park network in Southern California consisting of Channel Islands National Park, Santa Monica National Recreational Area, and Cabrillo National Monument.

Greater Yellowstone

A 3-park network consisting of Yellowstone NP, Grand Tetons NP, and Bighorn Canyon National Recreational Area.

Appalachian Highlands

A 4-park network located in the southeastern United States. Reference park: Great Smoky Mountains National Park.

San Francisco Bay

A network of six parks located in the vicinity of San Francisco Bay. Reference park: Point Reyes National Seashore.

During FY 2001, all seven of these networks organized their Board of Directors and technical committees and developed network charters signed by all of the park superintendents. Network coordinators have been hired by all seven networks, and most have now hired data managers to begin compiling and summarizing existing information and understanding. Network coordinators spent much of their time developing cooperative agreements with universities and other agencies, and working with parks to identify high-priority issues and data needs. All seven networks have scheduled scoping workshops in FY 2002 as part of the process for identifying vital signs for monitoring, and are in the process of organizing existing information and understanding in preparation for those workshops.

Table 2. Networks of parks receiving funding in FY 2001 to plan and design a park vital signs monitoring program.

Network	Region	# of Parks	FY 2001 Funding*
North Coast and Cascades	PW	7	\$195,100
Northeast Coastal and Barrier	NE	8	\$616,500
Heartland	MW	15	\$534,400
Sonoran Desert	IM	11	\$520,000
Cumberland/Piedmont	SE	14	\$326,600
Central Alaska	AK	3	\$150,000
National Capital	NC	11	\$150,000
Northern Colorado Plateau	IM	16	\$150,000
San Francisco Bay	PW	6	\$150,000
Greater Yellowstone	IM	3	\$150,000
Appalachian Highlands	SE	4	\$150,000
Mediterranean Coast	PW	3	\$150,000

* Funding amounts do not include funding for prototype LTEM parks that are included in some networks.

Prototype Long-term Ecological Monitoring (LTEM) Programs

As previously indicated, the LTEM program began in 1992. To address the variability among parks in ecological conditions, sizes, and management capabilities, and to develop monitoring expertise throughout this range of ecological and managerial diversity, natural resource park units were grouped into 10 major biogeographic areas or biomes. One park or park group from each major biome was competitively selected to serve as a prototype LTEM program for that biome. To address the needs of small parks, three of the prototype programs were designed as "cluster" programs, i.e., a grouping of 4-6 small parks, each of which lacked the full range of staff and resident expertise needed to conduct a long-range monitoring program on its own. This program has never been fully implemented because of insufficient funding (only 7 of the 11 programs have received funding as of FY 2000), but much has been learned from the prototype programs that can now be transferred to other parks as they develop their monitoring programs.

Seven funded prototype monitoring parks are continuing with previous funding and new funding is being provided to four previously unfunded prototypes (Olympic NP, Northern Cascades NP complex, Mammoth Cave NP, and the 5-park Northern Colorado Plateau prototype). These programs will serve as "centers of excellence" that will do more in-depth monitoring and continue research and development work to benefit other parks. They possess a wealth of experience and expertise related to the development and implementation of ecological monitoring that can greatly benefit other parks throughout the NPS. The prototype programs provide mentoring assistance to other parks undertaking long-term ecological monitoring, and provide technical assistance to staff from other parks on a wide variety of technical issues related to monitoring, including

conceptual design, database management, data integration and analysis, and reporting of monitoring findings. The USGS Biological Resources provides additional funding for protocol development and assistance in designing the prototype programs. The prototype monitoring parks will be nested within the network structure, and will provide expertise and support to other parks in their network.

Natural Resource Challenge funds were used in FY 2001 to initiate planning and design work in the four new prototype LTEM programs: Olympic NP, North Cascades NPS Complex, Mammoth Caves NP, and Northern Colorado Plateau cluster. The prototype LTEM programs were established primarily in an attempt to learn how to design scientifically credible and cost-effective monitoring programs in ecological settings of major importance to a number of NPS units.

Table 3. Amount of funding available to the NPS Prototype Monitoring Programs during FY 2001. Base funds represent the amount transferred to the program's base account through FY 2001.

Channel Islands NP	\$622,000	-0-	622,000
Shenandoah NP	448,000	-0-	448,000
Great Smoky Mountains NP	560,000	-0-	560,000
Denali NP	150,000	485,000	635,000
Cape Cod NS	513,000	189,000	702,000
Prairie Park Cluster	504,000	-0-	504,000
South Florida/ Caribbean Cluster	229,500	-0-	229,500
Mammoth Cave NP	60,000	-0-	60,000
Mammoth Cave NP	200,000	200,000	400,000
North Cascades NP	200,000	200,000	400,000
Olympic NP	200,000	200,000	400,000
Northern Colorado Plateau Park Cluster	-0-	100,000	100,000

Examples of Direct Use of Monitoring Results in Management Decisions:

- Early warnings of abalone population collapses (five species) in Channel Islands National Park led to fishery closures [by the State] that prevented extinction and to the first marine invertebrate endangered species listing.
- Law enforcement is integrated with inventory and monitoring to protect American ginseng in Great Smoky Mountains NP. Ginseng is a rare, long-lived herb that is the most poached species in the park. Plants seized by rangers are aged and re-planted back into the watershed of origin to be part of long-term monitoring program. This program assesses poaching pressure and effectiveness of counter-measures. Age structure data from the monitored roots proved decisive in getting the Office of Scientific Authority (in USF&WS), which approves exports from states and the U.S., to ban all exports of roots younger than 5 years of age.
- Understanding of intertidal community dynamics from monitoring in Cabrillo National Monument prevented unnecessary litigation. It demonstrated that a sewage spill did not cause irreparable damage and that closures due to health concerns provided significant resource benefits. The beneficial change stimulated community involvement in restoration efforts and community support for changes in visitor management to provide for more valuable recreational and educational experiences.
- Hydrological and ecological monitoring data at the Hatches Harbor salt marsh restoration site at Cape Cod NS are being used to document the response of a degraded salt marsh ecosystem to reintroduction of tidal flow. Monitoring is used to quantify restoration success.
- Early warning of island fox population declines and understanding ecological connections among 19th century ranching, feral pigs, alien fennel, DDT, bald eagles, golden eagles, and foxes led to timely restoration efforts in Channel Islands National Park.
- Population dynamics information on alien rabbits and feral pigs guided effective eradication of those species that initiated island recovery and prevented extinction of endemic species in Channel Islands National Park.
- Documented population declines of species taken from Channel Islands National Park kelp forests by legal fishing and consequent persistent loss of 80% of park kelp forests prompted passage of state laws to revise marine resource management strategies and protection in California through use of marine protected areas.
- The rare plant monitoring program at Shenandoah NP provides a good example of increased data utility through improved data management and organization. SHEN contains 50 state rare plant species found at 162 locations within the park. These data have been compiled, organized, and an electronic framework has been implemented

for managing records. In addition, a GIS database was begun and is continually updated with new entries. These changes have greatly improved the accessibility of the data and therefore its usefulness for application to resources protection.

- The restoration project at Big Meadows in Shenandoah NP, a high elevation meadow rich in archeological resources and rare plants and animals, and the most popular visitor destination in the park, provides an example of a success story in the SHEN vegetation monitoring program. The project involved the collection of monitoring data that was used to influence need for, determine type, and evaluate success of management actions. After evaluating monitoring data and based on recommendations from an interdivisional workgroup, collaborative management has been implemented using staff from Natural and Cultural Resources, Maintenance, Ranger Activities (Fire and Law Enforcement), Interpretation and Education, and Administration (GIS).
- Park managers at five small prairie parks (Scott's Bluff NM, Pipestone NM, Effigy Mounds NM, Homestead NMA, and Wilson's Creek NB) are using data from the monitoring program to gauge restoration success and modify restoration methods or prescribed fire regimes for prairie restoration.
- At Cape Cod NS, monitoring data are being shared with neighboring municipalities to allow both the NPS and local towns to better evaluate environmental impacts of proposed actions outside park lands, and data are being shared with state agencies to assist in statewide planning and analyses, and to evaluate the regional importance of CACO to state threatened and endangered species such as the piping plover (*Charadrius melodus*).

Appendices

Appendix I. Natural resource units included in the NPS Inventory and Monitoring Program.

PARKCODE	PARKNAME	Region	State
ABLI	Abraham Lincoln Birthplace NHS	Southeast	KY
ACAD	Acadia National Park	Northeast	ME
AGFO	Agate Fossil Beds National Monument	Midwest	NE
ALAG	Alagnak Wild River	Alaska	AK
ALFL	Alibates Flint Quarries NM	Intermountain	TX
ALPO	Allegheny Portage Railroad N.H.S.	Northeast	PA
AMIS	Amistad National Recreational Area	Intermountain	TX
AMME	American Memorial Park	Pacific West	CM
ANIA	Aniakchak National Monument and Preserve	Alaska	AK
ANTI	Antietam National Battlefield	National Capital	MD
APCO	Appomattox Court House N.H.P.	Northeast	VA
APIS	Apostle Islands National Lakeshore	Midwest	WI
APPA	Appalachian National Scenic Trail	Multi	
ARCH	Arches National Park	Intermountain	UT
ARPO	Arkansas Post National Memorial	Midwest	AR
ASIS	Assateague Island National Seashore	Northeast	MD
AZRU	Aztec Ruins National Monument	Intermountain	NM
BADL	Badlands National Park	Midwest	SD
BAND	Bandelier National Monument	Intermountain	NM
BELA	Bering Land Bridge National Preserve	Alaska	AK
BEOL	Bent's Old Fort National Historic Site	Intermountain	CO
BIBE	Big Bend National Park	Intermountain	TX
BICA	Bighorn Canyon National Recreation Area	Intermountain	MT
BICY	Big Cypress National Preserve	Southeast	FL
BIHO	Big Hole National Battlefield	Pacific West	MT
BISC	Biscayne National Park	Southeast	FL
BISO	Big South Fork Nat. River & Rec. Area	Southeast	TN
BITH	Big Thicket National Preserve	Intermountain	TX
BLCA	Black Canyon of the Gunnison National Park	Intermountain	CO
BLRI	Blue Ridge Parkway	Southeast	NC
BLUE	Bluestone National Scenic River	Northeast	WV
BOHA	Boston Harbor Islands N.R.A.	Northeast	MA
BOWA	Booker T. Washington National Monument	Northeast	VA
BRCA	Bryce Canyon National Park	Intermountain	UT
BUFF	Buffalo National River	Midwest	AR
BUIS	Buck Island Reef National Monument	Southeast	VI
CABR	Cabrillo National Monument	Pacific West	CA
CACH	Canyon de Chelly National Monument	Intermountain	AZ
CACO	Cape Cod National Seashore	Northeast	MA

CAGR	Casa Grande National Monument	Intermountain	AZ
CAHA	Cape Hatteras National Seashore	Southeast	NC
CAKR	Cape Krusenstern National Monument	Alaska	AK
CALO	Cape Lookout National Seashore	Southeast	NC
CANA	Canaveral National Seashore	Southeast	FL
CANY	Canyonlands National Park	Intermountain	UT
CARE	Capitol Reef National Park	Intermountain	UT
CARL	Carl Sandburg Home N.H.S.	Southeast	NC
CASA	Castillo de San Marcos N.M.	Southeast	FL
CATO	Catoctin Mountain Park	National Capital	MD
CAVE	Carlsbad Caverns National Park	Intermountain	NM
CAVO	Capulin Volcano National Monument	Intermountain	NM
CEBR	Cedar Breaks National Monument	Intermountain	UT
CHAT	Chattahoochee River N.R.A.	Southeast	GA
CHCH	Chickamauga/Chattanooga N.M.P.	Southeast	GA
CHCU	Chaco Culture National Historic Park	Intermountain	NM
CHIC	Chickasaw National Recreation Area	Intermountain	OK
CHIR	Chiricahua National Monument	Intermountain	AZ
CHIS	Channel Islands National Park	Pacific West	CA
CHOH	Chesapeake & Ohio Canal N.H.P.	National Capital	MD
CIRO	City of Rocks National Reserve	Pacific West	ID
COLM	Colorado National Monument	Intermountain	CO
COLO	Colonial National Historical Park	Northeast	VA
CORO	Coronado National Memorial	Intermountain	AZ
COSW	Congaree Swamp National Monument	Southeast	SC
COWP	Cowpens National Battlefield	Southeast	SC
CRLA	Crater Lake National Park	Pacific West	OR
CRMO	Craters of the Moon National Monument	Pacific West	ID
CUGA	Cumberland Gap National Historic Park	Southeast	KY
CUIS	Cumberland Island National Seashore	Southeast	GA
CURE	Curecanti National Recreation Area	Intermountain	CO
CUVA	Cuyahoga Valley National Park	Midwest	OH
DENA	Denali National Park and Preserve	Alaska	AK
DEPO	Devil's Postpile National Monument	Pacific West	CA
DETO	Devils Tower National Monument	Intermountain	WY
DEVA	Death Valley National Monument	Pacific West	CA
DEWA	Delaware Water Gap NRA & Upper Delaware	Northeast	PA
DINO	Dinosaur National Monument	Intermountain	CO
DRTO	Dry Tortugas National Park	Southeast	FL
EBLA	Ebey's Landing National Historical Res.	Pacific West	WA
EFMO	Effigy Mounds National Monument	Midwest	IA
EISE	Eisenhower NHS	Northeast	PA
ELMA	El Malpais National Monument	Intermountain	NM
ELMO	El Morro National Monument	Intermountain	NM
EVER	Everglades National Park	Southeast	FL
FIIS	Fire Island National Seashore	Northeast	NY
FLFO	Florissant Fossil Beds N.M.	Intermountain	CO
FOBO	Fort Bowie National Historic Site	Intermountain	AZ

FOBU	Fossil Butte National Monument	Intermountain	WY
FOCA	Fort Caroline National Monument	Southeast	FL
FOCL	Fort Clatsop National Memorial	Pacific West	OR
FODA	Fort Davis National Historic Site	Intermountain	TX
FODO	Fort Donelson National Battlefield	Southeast	TN
FOFR	Fort Frederica National Monument	Southeast	GA
FOLA	Fort Laramie National Historic Site	Intermountain	WY
FOLS	Fort Larned National Historic Site	Midwest	KS
FOMA	Fort Matanzas National Monument	Southeast	FL
FONE	Fort Necessity National Battlefield	Northeast	PA
FOPO	Fort Point National Historic Site	Pacific West	CA
FOPU	Fort Pulaski National Monument	Southeast	GA
FOSC	Fort Scott National Historic Site	Midwest	KS
FOSU	Fort Sumter/Fort Moultrie N.M.	Southeast	SC
FOUN	Fort Union National Monument	Intermountain	NM
FOUS	Fort Union Trading Post NHS	Midwest	ND
FOVA	Fort Vancouver National Historic Site	Pacific West	WA
FRHI	Friendship Hill National Historic Site	Northeast	PA
FRSP	Fredericksburg Bt'l Fd/Spotsylvania NMP	Northeast	VA
GAAR	Gates of the Arctic Nat'l Park/Preserve	Alaska	AK
GARI	Gauley River National Recreation Area	Northeast	WV
GATE	Gateway National Recreation Area	Northeast	NY
GETT	Gettysburg National Military Park	Northeast	PA
GEWA	George Washington Birthplace N.M.	Northeast	VA
GICL	Gila Cliff Dwellings National Monument	Intermountain	NM
GLAC	Glacier National Park	Intermountain	MT
GLBA	Glacier Bay National Park and Preserve	Alaska	AK
GLCA	Glen Canyon National Recreation Area	Intermountain	UT
GOGA	Golden Gate National Recreation Area	Pacific West	CA
GOSP	Golden Spike National Historic Site	Intermountain	UT
GRBA	Great Basin National Park	Pacific West	NV
GRCA	Grand Canyon National Park	Intermountain	AZ
GREE	Greenbelt Park	National Capital	MD
GRKO	Grant-Kohrs Ranch N.H.S.	Intermountain	MT
GRPO	Grand Portage National Monument	Midwest	MN
GRSA	Great Sand Dunes National Park	Intermountain	CO
GRSM	Great Smoky Mountains National Park	Southeast	TN
GRTE	Grand Teton National Park	Intermountain	WY
GUCO	Guilford Courthouse N.M.P.	Southeast	NC
GUIS	Gulf Islands National Seashore	Southeast	FL/MS
GUMO	Guadalupe Mountains National Park	Intermountain	TX
GWCA	George Washington Carver N.M.	Midwest	MO
GWMP	George Washington Memorial Parkway	National Capital	VA
HAFE	Harpers Ferry National Historical Park	National Capital	WV
HAFO	Hagerman Fossil Beds National Monument	Pacific West	ID
HALE	Haleakala National Park	Pacific West	HI
HAVO	Hawaii Volcanoes National Park	Pacific West	HI
HEHO	Herbert Hoover National Historic Site	Midwest	IA

HOBE	Horseshoe Bend National Military Park	Southeast	AL
HOCU	Hopewell Culture National Historic Park	Midwest	OH
HOFU	Hopewell Furnace National Historic Site	Northeast	PA
HOME	Homestead National Monument of America	Midwest	NE
HOSP	Hot Springs National Park	Midwest	AR
HOVE	Hovenweep National Monument	Intermountain	CO
HUTR	Hubbell Trading Post National Historic Site	Intermountain	AZ
INDU	Indiana Dunes National Lakeshore	Midwest	IN
ISRO	Isle Royale National Park	Midwest	MI
JECA	Jewel Cave National Monument	Midwest	SD
JELA	Jean LaFitte Nat. Hist. Park & Preserve	Southeast	LA
JODA	John Day Fossil Beds National Monument	Pacific West	OR
JOFL	Johnstown Flood National Memorial	Northeast	PA
JOMU	John Muir National Historic Site	Pacific West	CA
JOTR	Joshua Tree National Monument	Pacific West	CA
KAHO	Kaloko Honokohau National Historic Park	Pacific West	HI
KALA	Kalaupapa National Historic Park	Pacific West	HI
KATM	Katmai National Park and Preserve	Alaska	AK
KEFJ	Kenai Fjords National Park	Alaska	AK
KEMO	Kennesaw Mountain National Battlefield	Southeast	GA
KIMO	Kings Mountain National Military Park	Southeast	SC
KLGO	Klondike Gold Rush N.H.P.	Alaska	AK
KNRI	Knife River Indian Villages N.H.S.	Midwest	ND
KOVA	Kobuk Valley National Park	Alaska	AK
LABE	Lava Beds National Monument	Pacific West	CA
LACL	Lake Clark National Park and Preserve	Alaska	AK
LAME	Lake Mead National Recreation Area	Pacific West	NV
LAMR	Lake Meredith NRA	Intermountain	TX
LARO	Lake Roosevelt National Recreation Area	Pacific West	WA
LAVO	Lassen Volcanic National Park	Pacific West	CA
LIBI	Little Bighorn National Monument	Intermountain	MT
LIBO	Lincoln Boyhood National Monument	Midwest	IN
LIRI	Little River Canyon National Preserve	Southeast	AL
LYJO	Lyndon B. Johnson N.H.P.	Intermountain	TX
MABI	Marsh-Billings-Rockefeller National Historical Park	Northeast	VT
MACA	Mammoth Cave National Park	Southeast	KY
MANA	Manassas National Battlefield Park	National Capital	VA
MANZ	Manzanar NHS	Pacific West	CA
MEVE	Mesa Verde National Park	Intermountain	CO
MIMA	Minute Man National Historic Park	Northeast	MA
MISS	Mississippi Nat'l River and Rec. Area	Midwest	MN
MNRR	Missouri National Recreation River	Midwest	NE
MOCA	Montezuma Castle National Monument	Intermountain	AZ
MOCR	Moore's Creek National Battlefield	Southeast	NC
MOJA	Mojave National Preserve	Pacific West	CA
MONO	Monocacy National Battlefield	National Capital	MD
MORA	Mount Rainer National Park	Pacific West	WA
MORR	Morristown National Historical Park	Northeast	NJ

MORU	Mount Rushmore National Memorial	Midwest	SD
MUWO	Muir Woods National Monument	Pacific West	CA
NABR	Natural Bridges National Monument	Intermountain	UT
NACE	National Capital Parks East	National Capital	DC
NATR	Natchez Trace Parkway	Southeast	MS
NAVA	Navajo National Monument	Intermountain	AZ
NEPE	Nez Perce National Historic Park	Pacific West	ID
NERI	New River Gorge National River	Northeast	WV
NIOB	Niobrara National Scenic River	Midwest	NE
NISI	Ninety Six National Historic Site	Southeast	SC
NOAT	Noatak National Preserve	Alaska	AK
NOCA	North Cascades National Park	Pacific West	WA
NPSA	National Park of American Samoa	Pacific West	HI
OBRI	Obed Wild and Scenic River	Southeast	TN
OCMU	Ocmulgee National Monument	Southeast	GA
OLYM	Olympic National Park	Pacific West	WA
ORCA	Oregon Caves National Monument	Pacific West	OR
ORPI	Organ Pipe Cactus National Monument	Intermountain	AZ
OZAR	Ozark National Scenic Riverways	Midwest	MO
PAAL	Palo Alto Battlefield N.H.P.	Intermountain	TX
PAIS	Padre Island National Seashore	Intermountain	TX
PECO	Pecos National Historic Park	Intermountain	NM
PEFO	Petrified Forest National Park	Intermountain	AZ
PERI	Pea Ridge National Military Park	Midwest	AR
PETE	Petersburg National Battlefield	Northeast	VA
PETR	Petroglyph National Monument	Intermountain	NM
PINN	Pinnacles National Monument	Pacific West	CA
PIPE	Pipestone National Monument	Midwest	MN
PIRO	Pictured Rocks National Lakeshore	Midwest	MI
PISP	Pipe Spring National Monument	Intermountain	AZ
PORE	Point Reyes National Seashore	Pacific West	CA
PRWI	Prince William Forest Park	National Capital	VA
PUHE	Puukohola Heiau National Historic Site	Pacific West	HI
PUHO	Pu'uuhonua o Honaunau N.H.P.	Pacific West	HI
RABR	Rainbow Bridge National Monument	Intermountain	UT
REDW	Redwood National Park	Pacific West	CA
RICH	Richmond National Battlefield Park	Northeast	VA
ROCR	Rock Creek Park	National Capital	DC
ROMO	Rocky Mountain National Park	Intermountain	CO
ROVA	Roosevelt-Vanderbilt NHS	Northeast	NY
RUCA	Russell Cave National Monument	Southeast	AL
SAAN	San Antonio Missions National H.S.	Intermountain	TX
SACN	Saint Croix National Scenic Riverway	Midwest	WI
SAGA	Saint-Gaudens National Historic Site	Northeast	NH
SAGU	Saguaro National Monument	Intermountain	AZ
SAHI	Sagamore Hill National Historic Site	Northeast	NY
SAIR	Saugus Iron Works N.H.S.	Northeast	MA
SAJH	San Juan Island National Historic Park	Pacific West	WA

SAMO	Santa Monica Mountains N.R.A.	Pacific West	CA
SAPU	Salinas Pueblo Missions N.M.	Intermountain	NM
SARA	Saratoga National Historic Park	Northeast	NY
SCBL	Scotts Bluff National Monument	Midwest	NE
SEKI	Sequoia-Kings Canyon National Park	Pacific West	CA
SHEN	Shenandoah National Park	Northeast	VA
SHIL	Shiloh National Military Park	Southeast	TN
SITK	Sitka National Historic Park	Alaska	AK
SLBE	Sleeping Bear Dunes National Lakeshore	Midwest	MI
STRI	Stones River National Battlefield	Southeast	TN
SUCR	Sunset Crater National Monument	Intermountain	AZ
TAPR	Tallgrass Prairie National Preserve	Midwest	KS
THRO	Theodore Roosevelt National Park	Midwest	ND
THST	Thomas Stone National Historic Site	Northeast	MD
TICA	Timpanogas Cave National Monument	Intermountain	UT
TIMU	Timucuan Ecological and Historic Res.	Southeast	FL
TONT	Tonto National Monument	Intermountain	AZ
TUMA	Tumacacori National Historic Park	Intermountain	
TUZI	Tuzigoot National Monument	Intermountain	AZ
UPDE	Upper Delaware Scenic & R.R.	Northeast	PA
VAFO	Valley Forge National Historic Park	Northeast	PA
VICK	Vicksburg National Military Park	Southeast	MS
VIIS	Virgin Islands National Park	Southeast	VI
VOYA	Voyageurs National Park	Midwest	MN
WABA	Washita Battlefield National Historic Site	Intermountain	OK
WACA	Walnut Canyon National Monument	Intermountain	AZ
WAPA	War in the Pacific N.H.P.	Pacific West	GU
WEFA	Weir Farm National Historic Site	Northeast	CT
WHIS	Whiskeytown National Recreation Area	Pacific West	CA
WHMI	Whitman Mission National Historic Site	Pacific West	WA
WHSa	White Sands National Monument	Intermountain	NM
WICA	Wind Cave National Park	Midwest	SD
WICR	Wilson's Creek National Battlefield	Midwest	MO
WOTR	Wolf Trap Farm	National Capital	
WRST	Wrangell St. Elias Nat'l Park/Preserve	Alaska	AK
WUPA	Wupatki National Monument	Intermountain	AZ
YELL	Yellowstone National Park	Intermountain	WY
YOSE	Yosemite National Park	Pacific West	CA
YUCH	Yukon Charley Rivers National Park	Alaska	AK
YUHO	Yucca House National Monument	Intermountain	CO
ZION	Zion National Park	Intermountain	UT

Appendix II-A. Amount of funding allocated to basic natural resource inventories by the National Park Service during FY 2001.

Program Component	Funding in FY 2001
Bibliographies	\$ 70,000
Base Cartography Data	80,000
Biological Inventories	
Network-Based	5,906,293
Non-Network	648,407
Vegetation Mapping	2,250,000
Air Quality Data	123,000
Water Quality Data	288,700
Soil Surveys	986,100
Geology Inventories	407,000
Total	\$ 10,759,500

Appendix II-B. Projected completion schedule for baseline natural resource inventories being conducted by the National Park Service Inventory and Monitoring Program.

Basic Data Sets	2001 <u>1/</u>		2002 <u>2/</u>		2003 <u>3/</u>	2004 <u>4/</u>	2005-10 <u>5/</u>
	Underway	Completed	Underway	Completed	Completed	Completed	To be Completed
Automated Bibliographies	2	257	7	263	270	270	0
Base Cartographic Data	22	248	0	270	270	270	0
Higher Plant and Animal Occurrence (species lists)	62	210	0	270	270	270	0
Distribution of Species of Special Concern	271	0	271	0	0	250	21
Vegetation Maps	17	22	40	27	37	52	218
Soils Maps	117	37	97	57	80	100	172
Geology Maps	239	2	227	14	26	38	232
Water Resource Locations (digital)	271	0	141	271	271	271	0
Water Chemistry	46	225	0	271	271	271	0
Air Quality	0	250	0	250	250	250	0
Air Quality-Related Values	0	0	0	0	0	50	220
Meteorological Data	0	0	135	135	270	270	0

1/ Based on 11/24/99, 2/27/01, and 6/21/01 data. Numbers reflect end of FY conditions.

X/ The Servicewide program acquires basic inventory data sets for about 272 parks with significant natural resources. However, some parks have acquired some of these data sets and a few parks may not need all 12 sets. The parks to complete reflect the number of parks Servicewide with outstanding needs.

Appendix II-C. Allocations by the Inventory and Monitoring Program for inventories other than network biological inventories during FY 2001.

Organization	Title	FY 2001 Funding
BIOTIC INVENTORIES		
NPS	Database Contract	\$ 135,000
NPS	IT IS Development	20,000
Grand Teton NP	Vegetation	2,500
Bandelier NM	Vegetation	2,500
Thomas Stone NHS	Vegetation	109,447
New River Gorge National River	Vegetation	70,770
Rocky Mountain NP	Vegetation	20,000
Northeast Regional Office	Vegetation	85,700
Yosemite NP	Vegetation	2 75,000
Sequoia/Kings Canyon NP	Vegetation	195,300
Glacier NP	Vegetation	199,500
Delaware Water Gap NRA	Vegetation	146,000
Morristown NHP	Vegetation	11,300
Coastal and Barrier Network	Vegetation	57,500
Mid-Atlantic Network	Vegetation	160,400
Cape Cod NS	Vegetation	8,000
Black Canyon of the Gunnison NM	Vegetation	11,000
Great Smoky Mountains NP	Vegetation	35,000
Florissant Fossil Beds NM	Vegetation	137,814
Fort Union Trading Post NHS	Vegetation	45,000
Effigy Mounds NM	Vegetation	128,081
Alaska NP's	Vegetation	500,000
Olympic NP	Amphibian Inventory (cont. FY00)	108,000
Fort Necessity	Herp Inventory (cont. FY00)	35,000
Friendship Hill	Herp Inventory (cont. FY00)	35,000
Gettysburg NMP	Bird Inventory (cont. FY00)	30,000
Hopewell Furnace NHS	Bird inventory (cont. FY00)	30,000
Valley Forge NHP	Bird Inventory (cont. FY00)	30,000
Eisenhower NHS	Bird Inventory (cont. FY00)	30,000
Allegheny Portage Railroad NHS	Bird Inventory (cont. FY00)	30,000
Johnstown Flood NM	Bird Inventory (cont. FY00)	30,000
Grand Canyon NP	Bird Inventory (cont. FY00)	44,600
Yukon-Charley Rivers NP	Bird Inventory (cont. FY00)	81,200
Alaska NP's	Habitat Delineation	197,000
ABIOTIC INVENTORIES		
NPS	Base Cartography	80,000
NPS	Map Digitizing	55,000
NPS	Horizon Report Format	100,000
NPS	Water Body Classification	50,000
Sagamore Hill NHS	Water Quality	4,700
Hopewell Furnace NHS	Water Quality	29,500

Richmond NBP	Water Quality	28,000
Walnut Canyon NM	Water Quality	2,800
Navajo NM	Water Quality	17,000
Alaska NP's	Water Quality	24,000
Appalachian Trail	Bibliography	40,000
Columbia-Cascades SO	Bibliography	70,000
Intermountain Region Parks	Soils	26,100
Denali NPP	Soils	87,200
Big Bend NP	Soils	12,000
Crater Lake NP	Soils	79,500
Channel Islands NP	Soils	126,500
Redwoods NP	Soils	112,800
Grand Canyon NP	Soils	177,000
Padre Islands NP	Soils	100,000
Big Bend NP	Soils	15,000
Great Smoky Mountains NP	Soils	195,000
Hovenweep NM	Geology	1,500
Glen Canyon NRA	Geology	50,000
Death Valley NP	Geology	50,000
Great Smoky Mountains NP	Geology	5,000
Guilford Courthouse NMP	Geology	1,500
Kings Mountain NMP	Geology	22,000
Badlands NP	Geology	4,000

Appendix II-D. Amount of funding provided to individual park networks during FY2001 for conducting inventories of vertebrates and vascular plants

Network	Total Budget	FY 2001 Allocation
Southwest Alaska Network	1,331,828	180,200
Northwest Alaska Network	1,437,470	348,183
Central Alaska Network	942,915	262,334
Southeast Alaska Network	404,648	145,372
Great Lakes Network	1,181,860	245,651
Heartland Network	788,301	230,100
Northern Great Plains Network	782,749	128,456
Mid-Atlantic Network	424,635	0
Eastern Rivers and Mountains Network	602,551	30,000
Northeast Coastal and Barrier Network	866,885	0
Northeast Temperate Network	579,880	262,334
National Capital Network	686,257	114,026
Cumberland/Piedmont Network	565,541	135,005
Southeast Coast Network	1,163,014	228,857
Gulf Coast Network	852,881	203,800
Appalachian Highlands Network	675,657	151,952
South Florida/Caribbean Network	1,398,877	305,417
Northern Colorado Plateau Network	1,037,439	290,643
Rocky Mountain Network	580,733	95,000
Greater Yellowstone Network	665,742	142,100
Southern Colorado Plateau Network	1,185,253	444,403
Southern Plains Network	310,302	171,000
Sonoran Desert Network	615,521	533,500
Chihuahuan Desert Network	709,820	13,000
North Coast and Cascades Network	787,636	163,100
Northern Semi-Arid Network	481,769	139,792
San Francisco Bay Network	682,333	158,765
Mojave Desert Network	780,669	100,000
Mediterranean Coast Network	731,032	149,504
Sierra Network	602,002	107,500
Pacific Islands Network (Hawaiian parks)	900,000	217,860
Klamath Network	731,392	79,032
Guam	129,669	41,669
American Samoa	190,210	61,210
Saipan	86,528	26,528
Totals	25,893,999	5,906.293

Appendix II-E. Amount of funding for major NPS vegetation mapping projects during FY 2001 and associated expenditures by partnering entities.

Vegetation Mapping Project	NRC Funding	FirePro	USGS Funding	Other NPS
Sequoia /Kings Canyon NP	\$ 195,300	\$ 30,000	\$ 135,000	
Yosemite NP	\$ 275,000	\$ 34,000		
Glacier NP	\$ 199,500	\$ 23,000	\$ 260,350	
Grand Teton NP	\$ 1,500	\$120,000		
Rocky Mountain NP	\$ 20,000	\$314,000		
Bandelier NM	\$ 1,500	\$ 8,000		
Florissant Fossil Beds NM	\$ 137,814			
Black Canyon of Gunnison NP	\$ 11,000			
Effigy Mounds NM	\$ 128,081			
Knife River Indian Village/ Fort Union Trading Post NM	\$ 45,000			
Great Smoky Mountains NP	\$ 35,000			
Northeast Region Parks	\$ 460,900			\$ 227,763
AZ3				
Zion				
Whiskeytown				
Santa Monica Mountains				
Bandelier				
Grand Teton				
Shenandoah				
North. Colorado Plateau				
Cumberland/Piedmont Parks				
Appalachian Highlands parks				
IM Region				
Database/Protocols	\$ 137,405			
Program Administration	\$ 102,000			
Totals	\$ 1,750,000	\$ 732,000	\$395,350	\$ 227,763

Appendix II-F. Amount of funding for major NPS vegetation mapping projects during FY 2001 and associated expenditures by partnering entities involving no NPS funding.

Vegetation Mapping Project	NRC Funding	FirePro	USGS Funding	Other NPS
Walnut Canyon NM			134,762	
Zion NP			221,000	
Point Reyes NS		100,000		
Whiskeytown NRA		75,000		
Santa Monica Mountains NRA		290,000		
Bandelier NM		8,000		
Grand Teton NP		120,000		
Shenandoah NP		70,000		112,000
North. Colorado Plateau		100,000		156,814
Cumberland/Piedmont Parks				258,536
Appalachian Highlands Parks				80,300
IM Region		5,000		
Other Costs:				
ABI Agreement			50,000	
UMESC			132,400	
Program Administration			230,264	
Totals	-0-	\$ 768,000	\$768,426	\$ 607,650

Appendix II-G. Amount of funding for major NPS geologic inventory projects during FY 2001 and associated expenditures by partnering agencies.

In some cases, partner funding is for an area larger than but inclusive of NPS lands.

Geologic Inventory Project	NPS Funding	Partner	Partner Funding
Death Valley NP Map Compilation	\$ 50,000	USGS	\$ 641,502
Ozark NSR Mapping	\$ 15,000	USGS	\$ 545,000
National Capitol Parks	\$ 23,000	USGS	\$ 56,858
Kings Mountain NP Map Compilation	\$ 10,000	USGS	\$ 73,390
Glacier NP Mapping	\$ 47,000	Utah GS	\$ 49,943
Kings Mountain NP Mapping	\$ 12,000	South Carolina GS	\$ 47,850
Gulf Island NS Mapping	\$ 1,500	Guilford College	\$ 550
Totals	\$ 158,500		\$ 1,415,093